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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/759,354	01/16/2004	Takashi Kaito	S004-5191	9905

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EXAMINER

MCDONALD, RODNEY GLENN

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 10/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/759,354

Applicant(s)

KAITO ET AL.

Examiner

Rodney G. McDonald

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 17 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 31-37 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 31-37 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Double Patenting***

Claim 36 is objected to under 37 CFR 1.75 as being a substantial duplicate of claim 3. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

### ***Claim Rejections - 35 USC § 112***

Claims 31 and 32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 31 and 32, the phrase "such as" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 31 and 36 are rejected under 35 U.S.C. 102(b) as being anticipated by Kane et al. (U.S. Pat. 6,670,717).

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Regarding claim 1, Kane et al. teach a first step of processing at least one desired area in a surface of a sample to form a target surface. (Column 7 lines 50-53)  
A second step of scanning the target surface with a probe of a SPM (i.e. scanning probe microscope and detecting a physical quantity produced between the probe and the target surface. (Column 8 lines 8-11; Column 4 lines 34-42)

Regarding claim 2, the first step includes a substep of carrying out an etching process by irradiating the sample surface with a focused energy beam thereby to expose the target surface. (Column 7 lines 43-46)

Regarding claims 3, 36, the focused energy beam is a focused ion beam (FIB).  
(Column 7 lines 44-46)

Regarding claim 4, the first step includes the substep including a substep of decomposing an organic metal gas with a focused ion beam in a predetermined location of the sample to make an electrode and an interconnection after carrying out the etching process with the focused ion beam. Fig. 3 shows the electrode and interconnection.  
(Column 5 lines 10-17; Column 8 lines 2-5; Fig. 3)

Regarding claim 31, Kane et al. teach detecting the electrical conductivity of the surface. (Column 4 lines 37-42)

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kane et al. (U.S. Pat. 6,670,717) in view of Matsui et al. (U.S. Pat. 5,229,607).

Kane et al. is discussed above and all is as applies above. (See Kane et al. discussed above)

The difference between Kane et al. and the present claims is that combining the FIB apparatus with the microscope is not discussed for performing the process.

Matsui et al. teach combining a FIB device with a microscope in a single apparatus. (Column 11 lines 22-25; See Abstract)

The motivation for utilizing a combination apparatus is that it allows for utilizing a single evacuation system. (Column 3 lines 45-49)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Kane et al. by utilizing a single chamber for the FIB and microscope as taught by Matsui et al. because it allows for utilizing a single evacuation system.

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Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kane et al. (U.S. Pat. 6,670,717) in view of Yang et al. (U.S. Pat. 6,207,575).

Kane et al. is discussed above and all is as applies above. (See Kane et al. discussed above)

The difference between Kane et al. and the present claims is that repeating the step of exposing the target surface with the focused ion beam and the step of observing the exposed section with the probe being repeated sequentially is not discussed.

Yang et al. teach observing and etching repeatedly until the desired profile is achieved. (Column 6 lines 26-57)

The motivation for repeating the etching and the observing is that it allows for generation of a particular profile. (Column 6 lines 26-57)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Kane et al. by etching and observing repeatedly as taught by Yang et al. because it allows for generation of a particular profile.

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kane et al. (U.S. Pat. 6,670,717) in view of Muckenhirm (U.S. Pat. 6,986,280).

Kane et al. is discussed above and all is as applies above. (See Kane et al. discussed above)

The difference between Kane et al. and the present claims is that determining a mechanical solid state property of the sample is not discussed.

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Muckenhirm teach that a AFM (i.e. a SPM) can determine information about surface roughness, sidewall angels and roughness, and deviation from a straight line of a feature edge. (Column 5 lines 60-61; Column 11 lines 49-55)

The motivation for determining a solid state property such as surface roughness is that is allows determination if the surface is acceptable or the process for producing the surface need be adjusted. (Column 10 lines 37-47)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Kane et al. by utilizing a SPM to measure a solid state feature as taught by Muckenhirm because it allows for determination if the surface is acceptable or the process for producing the surface need be adjusted.

Claims 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kane et al. (U.S. Pat. 6,670,717) in view of Okazaki et al. (U.S. Pat. 6,437,343).

Kane et al. is discussed above and all is as applies above. (See Kane et al. discussed above)

The differences between Kane et al. and the present claims is utilizing a microscope unit to observe the position of the probe (claim 33) and the microscope unit comprising an optical microscope (claim 34)

Regarding claims 33, 34, Okazaki et al. teach utilizing an optical microscope to observe the position of the probe. (Column 18 lines 4-22)

The motivation for utilizing an optical microscope is that it allows for observing the position of the probe. (Column 18 lines 4-22)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Kane et al. by utilizing an optical microscope as taught by Okazaki et al. because it allows for observing the position of the probe.

Claims 33 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kane et al. (U.S. Pat. 6,670,717) in view of Hitachi (Japan 10-223170).

Kane et al. is discussed above and all is as applies above. (See Kane et al. discussed above)

The differences between Kane et al. and the present claims is utilizing a microscope unit to observe the position of the probe (Claim 33) and the microscope unit comprising a SEM (Claim 35).

Hitachi teach utilizing an SEM to determine the position of the probe. (See Abstract)

The motivation for utilizing a SEM is that it allows for observing the position of the probe. (See Abstract)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Kane et al. by utilizing a SEM as taught by Hitachi because it allows for observing the position of the probe.

Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi et al. (U.S. Pat. 4,933,565) in view of Yang et al. (U.S. Pat. 6,207,575).

Regarding claim 6, Yamaguchi et al. teach a first step of processing with an ion beam at least one desired area in a surface of a sample to expose a target surface.



(4A-4B; Column 5 lines 41-55) A second step of removing a damaged portion remaining in the exposed surface. (Column 7 lines 45-51) A stepped portion is formed after further working according to a difference in material amount the layers constructing the exposed surface. (Column 7 line 52)

Regarding claim 7, the exposed surface is mirror finished because the surface is made flat. (Column 7 lines 45-51)

The difference between Yamaguchi et al. and the present claims is that a third step of observing the exposed surface is not discussed. (Claim 6).

Regarding the third step of observing the exposed surface of Claim 6, Yang et al. teach observing the surface profile data of an interconnect by utilizing an atomic force microscope. (See Abstract)

The motivation for observing the exposed surface is that it allows for characterizing the surface profile data. (Column 2 lines 54-57)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Kane et al. by observing an exposed surface as taught by Yamaguchi et al. because it allows for characterizing the surface profile data.

Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi et al. in view of Yang et al. as applied to claims 6 and 7 above, and further in view of Azuma et al. (U.S. Pat. 5,683,547).

The difference not yet discussed is where the mirror finishing is conducted by irradiating an electron beam in parallel with blowing of an etching gas.

Azuma et al. teach irradiating an electron beam on a sample in an etching gas atmosphere. (See Abstract) The nozzle of Fig. 1 causes the blowing of the etching gas in parallel with the electron beam. (See Fig. 1) It is mirror finished because the surface is flat. (See Fig. 24a-24c)

The motivation for utilizing an electron beam with an etching gas is that it allows for local etching. (See Abstract)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have irradiated an electron beam in parallel with blowing of an etching gas as taught by Azuma et al. because it allows for local etching.

### ***Response to Arguments***

Applicant's arguments filed August 17, 2006 have been fully considered but they are not persuasive.

In response to the argument that Kane et al. do not teach the use of a probe to observe a target surface, it is argued that in Kane et al. the probe observes the target surface in that it determines if there is electrical continuity in the surface (i.e. conductivity is determined). Applicant's newly added claim 31 specifically required that the observed physical quantity of the surface can be the electrical conductivity. Therefore Kane et al. is understood to be observing the target surface. Furthermore newly cited Muckenhirm for teaching that the physical quantity can be surface roughness determined by the probe suggest that the target surface be observed for roughness, sidewall angle and roughness, and deviation from a straight line of a feature edge. This is similar if not the same as Applicant's requirement for utilizing the probe.

See For example Applicant's Fig. 1D where a probe is moved to determine the discontinuity in the sidewall. (See Kane et al. and Muckenhirm discussed above)

In response to the argument that Yamaguchi et al. does not teach the second step of removing a damaged portion remaining in the exposed surface and then forming a stepped portion according to a difference in materials among layers forming the exposed surface, it is argued that Yamaguchi teach correcting the defect and then working the circuit pattern. This is believed to be removing the defective portion by ion irradiation (Correcting) and continuing to etch (working) to form a stepped pattern. (See Yamaguchi discussed above)

In response to the argument that Yamaguchi et al. does not teach the third step of observing the exposed surface with a scanning probe microscope, it is argued that Yang et al. teach the third step of observing the exposed surface with a scanning probe microscope. (See Yang et al. discussed above)

In response to the argument that Yamaguchi does not disclose finishing an exposed surface into a mirror face before the formation of a stepped portion, it is argued at any point during the ion beam etching the surface is considered to be mirror finished because of the smooth surface created by the etching. Thus Yamaguchi suggest correcting the defect through ion beam etching (i.e. removing the damaged portion) and further working (i.e. creating the step). (See Yamaguchi et al. discussed above)

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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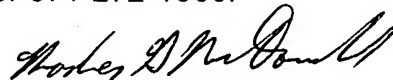
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Rodney G. McDonald  
Primary Examiner  
Art Unit 1753

RM  
October 27, 2006